Final Report

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Survey of Durum Production Practices

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Summary

Durum growers were surveyed in cooperation with the USDA's National Agricultural Statistics Service to determine production practices and their effects on yield and protein in the 2005 growing season. The survey was conducted in two regions: West (Yuma and La Paz counties) and Central (Maricopa, Pinal, and Pima counties). These two regions represent about 95% of the durum acreage. We obtained responses from 97 out of an estimated 195 durum growers (50%) representing 42,920 out of 75,400 acres (57%). Durum was grown following cotton (38%), lettuce (24%), vegetables (21%), or other crops. The predominant soil texture was a sandy loam (42%), followed by sandy clay loam (31%) and clay loam (21%). Herbicide was applied on 57% of the acreage. The major varieties were Kronos (21%), Alamo (16%), and Orita (16%). Level basin irrigation accounted for 52% of the acreage, followed by border flood (36%), and furrow (12%). The crop was typically irrigated 6 to 7 times. The average planting date (irrigation applied) was December 28 in the Central region and January 14 in the West region. The seed was planted at an average rate of 167 lbs/acre. Phosphorus was applied to only a third of the acreage, but when it was applied, the rate averaged 71 lbs P_2O_5/acre. Nitrogen rate averaged 213 lbs N/acre. Increased yield was associated with previous crops other than cotton, certain varieties, level basin irrigation, early planting in the Central region, a seeding rate between 140 and 160 lbs N per acre, N rate between 100 and 200 lbs N per acre, and an irrigation number of less than six in the West and seven in the Central Region. Grain protein was associated with varieties. This survey documents associations, not cause-and-effect relationships, among durum production practices, yield, and protein.

Introduction

Research on agricultural practices has traditionally been done in small plots by varying one aspect of management, called the treatment, and keeping all else constant. Clear conclusions can be drawn using this approach, but the applicability of the results is limited to the specific location and set of growing conditions. A method of conducting research that allows wider applicability of results is to correlate agricultural practices and yield from a large number of fields. The question is often asked how the top producers obtain high grain yield and protein. The problem with this approach is the accuracy of the information provided and the fact that correlation does not establish a cause-and-effect relationship. Nevertheless, some useful knowledge may be gained using survey methodology.

Procedures

A survey of durum production practices in 2005 was developed and sent to growers in two regions of Arizona: West (Yuma and La Paz counties) and Central (Maricopa, Pinal, and Pima counties). These two regions contained about 75,400 of the 79,000 acres of durum in the state in 2005, or about 95% of the durum acreage. We obtained responses from 97 out of an estimated 195 durum growers (50%) representing 42,920 out of 75,400 acres (57%). The information requested on the survey included town, previous crop, variety, herbicide applied, insecticide applied, PGR applied, manure or compost applied, irrigation system, soil texture, planting date, seeding rate,

fertilizer application, and number of irrigations applied. The survey responses were statistically analyzed using analysis of variance.

Results and Discussion

Durum acreage in 2005 was roughly split between the West (55%) and Central (45%) regions, and grain yield and protein in these regions was not significantly different (Table 1). The county with the greatest percentage of the acreage was Yuma (48%) followed by Pinal (20%) and Maricopa (20%). Grain yield was highest in Yuma and Pinal Counties, and grain protein was not different among counties.

Durum was most often planted after cotton (38%), or was planted after lettuce (24%) or miscellaneous vegetables (21%). The highest yields were obtained after lettuce in the West region.

The top four varieties in terms of percentage of acreage were Kronos (20%), Alamo (16%), and Orita (16%). Several varieties were grown in both regions, but some such as Kofa and Alamo were predominantly grown in the West region and others such as Ocotillo and Orita were predominantly grown in the Central region. In the West, the varieties were similar in yield and WestBred 881 was the highest in protein, and in the Central region, Kronos was the highest in yield and protein.

Herbicide was usually applied to most of the acreage in the West region, whereas only about a third of the acreage in the Central region received a herbicide application. Grain protein was slightly higher in the West when herbicide was not applied. Insecticide was only applied to 8% of the acreage and did not affect yield or protein. Plant growth regulator (PGR) to control lodging was applied to 3% of the acreage in the West but none in the Central region, and yield was less where this was applied. Manure or compost was applied to 13% of the acreage overall, and was associated with lower yield in the Central region.

The predominant irrigation system is level basin (52%) followed by border flood (36%) and furrow (12%). Grain yield was highest in the level basin system.

Durum was grown predominantly on sandy loam soil (42%) followed by sandy clay loam (31%) and clay loam (21%) soil. Grain yield was lower on sandy clay loam soil compared with clay loam and sandy loam.

The average planting date was January 14 in the West region and December 28 in the Central region. Planting date did not affect grain yield in the West region, but in the Central region, higher yield was observed in the December compared with January plantings.

The average seeding rate was 167 lbs seed/acre. Highest yields were reported for seeding rates between 140 and 159 lbs seed per acre.

The average nitrogen rate was 213 lbs N/acre. In both regions, the highest grain yield was associated with nitrogen rates between 100 – 199 lbs N/acre. The response of the durum crop to nitrogen fertilizer depends on several factors that were not included in this survey such as initial soil nitrogen content.

Only about a third of the durum acreage received P fertilizer, but a higher percentage of the acreage in the Central region received P fertilizer than in the West region presumably due to adequate soil P in the West from vegetable production. When P fertilizer was applied, the average phosphorus rate was 71 lbs P_2O_5/acre. Application of P fertilizer in the Central region was associated with higher grain yield, but again, response to P fertilizer is also influenced by other factors such as soil P.

The average number of irrigations applied was 6.6. The number of irrigations applied was associated with yield in both regions. In the West, grain yield was highest if less than six irrigations were applied and protein was highest with exactly six irrigations. In the Central region, seven irrigations was associated with higher yields.

This survey has shown that there are some associations between the various durum production practices and grain yield and protein, but these associations do not imply a cause-and-effect relationship. Side by side comparisons are

the best way to evaluate the direct effect of varieties, fertilizer rates, or irrigation practices. Nevertheless, there appears to be an association between higher yields and previous crops other than cotton, certain varieties, level basin irrigation, certain soil texture, early planting in the Central region, a seeding rate between 140 and 160 lbs seed per acre, N rate between 100 and 200 lbs N per acre, and irrigation number. Grain protein was associated with certain varieties and six irrigations in the West.

Acknowledgements

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Table 1. Number of survey respondents (N), grain yield, grain protein, and percentage of acres represented by various durum production practices in Arizona.

	West (Yuma and La Paz Co.)				Central (Maricopa, Pinal, and Pima Co.)				All (West and Central)			
	N	Yield	Protein	Acres	N	Yield	Protein	Acres	N	Yield	Protein	Acres
		lbs/a	%	%		lbs/a	%	%		lbs/a	%	%
Region												
West	46	6042	13.4	55	---	---	---	---	46	6042	13.4	55
Central	---	---	---	---	51	5996	13.3	45	51	5996	13.3	45
Significance		---	---			---	---			*NS*	*NS*	
County												
Yuma	42	6059	13.3	48	---	---	---	---	42	6059	13.3	48
Maricopa	---	---	---	---	15	5644	13.2	20	15	5644	13.2	20
Pinal	---	---	---	---	26	6388	13.5	20	26	6388	13.5	20
LaPaz	4	5855	13.6	7	---	---	---	---	4	5855	13.6	7
Pima	---	---	---	---	10	5506	13.2	6	10	5506	13.2	6
Significance		*NS*	*NS*			**	*NS*			**	*NS*	
Previous crop												
Cotton	5	5739	13.8	6	41	6022	13.3	32	46	5991	13.4	38
Lettuce	22	6352	13.5	24	---	---	---	---	22	6352	13.5	24
Vegetables	16	5824	13.1	21	---	---	---	---	16	5824	13.1	21
Durum	1	5800	13.5	3	4	5962	13.3	8	5	5929	13.3	10
Alfalfa	2	5250	13	1	3	6255	14.2	3	5	5853	13.8	4
Chile pepper	---	---	---	---	1	6000	13.5	1	1	6000	13.5	1
Sorghum	---	---	---	---	1	6000	---	1	1	6000	.	1
Fallow	---	---	---	---	1	4300	13.5	0	1	4300	13.5	0
Significance		**	*NS*			*NS*	*NS*			*NS*	*NS*	
Variety												
Kronos	11	5895	13.2	17	7	6909	14.1	4	18	6290	13.5	21
Alamo	14	6064	13.3	16	---	---	---	---	14	6064	13.3	16
Orita	1	7000	15	1	9	5438	13.3	15	10	5595	13.4	16
Kofa	10	6376	13.4	9	3	5347	13.3	1	13	6138	13.3	9
Duraking	4	5625	12.8	7	4	6175	13.5	3	8	5900	13	9
Westbred 881	5	5784	13.9	5	4	5464	13.1	4	9	5642	13.5	9
Ocotillo	---	---	---	---	10	5976	13.4	9	10	5976	13.4	9
Mohawk	---	---	---	---	4	6456	13.1	4	4	6456	13.1	4
Crown	---	---	---	---	5	6080	13	4	5	6080	13	4
Sky	1	6000	13	1	5	5982	13.1	2	6	5985	13.1	3
Significance		*NS*	+			*	*			*NS*	*NS*	
Herbicide applied												
No	14	6087	13.5	13	36	6037	13.4	30	50	6051	13.4	43
Yes	32	6022	13.3	42	15	5897	13.2	15	47	5982	13.2	57
Significance		*NS*	+			*NS*	*NS*			*NS*	*NS*	

Table 1 (Con'd). Number of survey respondents, grain yield, grain protein, and percentage of acres represented by various durum production practices in Arizona.

	West (Yuma and La Paz Co.)				Central (Maricopa, Pinal, and Pima Co.)				All (West and Central)			
	N	Yield	Protein	Acres	N	Yield	Protein	Acres	N	Yield	Protein	Acres
		lbs/a	%	%		lbs/a	%	%		lbs/a	%	%
Insecticide applied												
No	43	6042	13.4	52	50	5984	13.3	40	93	6011	13.4	92
Yes	3	6030	13.2	3	1	6590	13	5	4	6170	13.2	8
Significance		*NS*	*NS*			*NS*	*NS*			*NS*	*NS*	
PGR applied												
No	44	6064	13.4	52	51	5996	13.3	45	95	6028	13.4	97
Yes	2	5545	12.7	3	---	---	---	---	2	5545	12.7	3
Significance		+	*NS*			---	---			*NS*	+	
Manure or compost applied												
No	42	6005	13.4	51	42	6105	13.3	37	84	6055	13.4	88
Yes	4	6425	13.2	4	9	5489	13.3	8	13	5777	13.3	12
Significance		*NS*	*NS*			*	*NS*			*NS*	*NS*	
Irrigation system												
Level basin	36	6184	13.4	40	14	6421	13.3	12	50	6250	13.4	52
Border	10	5530	13	15	20	5963	13.5	21	30	5819	13.3	36
Furrow	---	---	---	---	16	5772	13.2	12	16	5772	13.2	12
Sprinkler	---	---	---	---	1	4300	13.5	0	1	4300	13.5	0
Significance		**	*NS*			*	*NS*			**	*NS*	
Soil texture												
Sandy loam	22	6242	13.5	18	30	6141	13.3	24	52	6184	13.4	42
Sandy clay loam	11	5919	13.2	21	12	5475	13.6	9	23	5687	13.4	31
Clay loam	10	5909	13.2	12	6	6424	13.3	9	16	6102	13.2	21
Silty clay loam	1	6400	14	3	1	5825	13.7	1	2	6113	13.9	4
Clay	1	5500	13.5	0	2	5750	12.5	3	3	5667	12.8	3
Sand	1	4500	.	0	---	---	---	---	1	4500	---	0
Significance		*	*NS*			*NS*	*			*	*NS*	
Planting date												
Dec	9	5889	13.8	6	32	6252	13.4	26	41	6172	13.5	32
Jan	33	6086	13.2	45	19	5566	13.2	19	52	5896	13.2	64
Feb	3	6360	13.7	4	---	---	---	---	3	6360	13.7	4
Mar	1	5000	13	0	---	---	---	---	1	5000	13	0
Significance		*NS*	*NS*			**	*NS*			*NS*	*NS*	

Table 1 (Con'd). Number of survey respondents, grain yield, grain protein, and percentage of acres represented by various durum production practices in Arizona.

	West (Yuma and La Paz Co.)				Central (Maricopa, Pinal, and Pima Co.)				All (West and Central)			
	N	Yield	Protein	Acres	N	Yield	Protein	Acres	N	Yield	Protein	Acres
		lbs/a	%	%		lbs/a	%	%		lbs/a	%	%
Seeding rate (lbs/a)												
75	---	---	---	---	1	6000	13.5	1	1	6000	13.5	1
120-139	7	5889	13.4	6	3	5667	13	1	10	5822	13.3	7
140-159	10	6304	13.4	9	13	6476	13.5	9	23	6401	13.4	18
160-179	16	5947	13.1	24	8	5763	13.3	5	24	5886	13.2	29
180-204	13	6039	13.6	17	26	5866	13.3	29	39	5923	13.4	45
Significance		*NS*	*NS*			+	*NS*			+	*NS*	
Nitrogen rate (lbs N/a)												
0-99	2	6145	13.2	2	7	5000	13.5	7	9	5254	13.4	8
100-199	13	6476	13.2	14	16	6156	13.3	15	29	6300	13.3	28
200-299	24	5805	13.3	26	20	6110	13.3	19	44	5944	13.3	46
300-499	7	6017	14.1	13	8	6261	13.4	5	15	6147	13.7	18
Significance		*	*NS*			**	*NS*			**	*NS*	
Phosphorus applied												
No	38	6040	13.3	46	23	5768	13.3	18	61	5938	13.3	64
Yes	8	6049	13.5	9	28	6183	13.4	27	36	6153	13.4	36
Significance		*NS*	*NS*			+	*NS*			*NS*	*NS*	
Number of irrigations												
<6	10	6470	12.9	10	23	5837	13.4	22	33	6029	13.3	31
6	14	5880	13.8	12	14	6111	13.3	13	28	5995	13.6	25
7	11	6027	13.1	14	5	7000	13.6	3	16	6331	13.3	17
>7	11	5873	13.4	19	9	5667	13	8	20	5780	13.2	27
Significance		+	*			*	*NS*			*NS*	*NS*	
All	46	6042	13.4	55	51	5996	13.3	45	97	6018	13.4	100

Significance: Statistical significance or probability that differences observed are due to chance. NS = not significant at the 10% probability level, + = significant at the 10% probability level, * = significant at the 5% probability level, and ** = significant at the 1% probability level.